AIR FORCE FLIGHT DYNAMICS LABORATORY
DIRECTOR OF LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT PATTERSON AIR FORCE BASE OHIO

IMPROVED PROGRAMS TO TRANSFER DATA FROM A NICOLET 1090 DIGITAL OSCILLOSCOPE TO A HEWLETT-PACKARD 9810 CALCULATOR

July 1979

Approved for public release; distribution unlimited.

Experimental Engineering Branch
Aeromechanics Division
Air Force Flight Dynamics Laboratory
Wright-Patterson Air Force Base, Ohio 45433

20000512 055

NOTICE

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that in any way be related thereto.

This Technical Memorandum has been reviewed and is approved for publication.

DAVID V. BREITENBECHER
Technical Manager, Electronics Group
Experimental Engineering Branch

JAMES T. VAN KUREN
Actg Chief, Experimental Engrg Br
Aeromechanics Division

PETER J. BUTKEWICZ, Col, USAF
Chief, Aeromechanics Division
Air Force Flight Dynamics Laboratory

ABSTRACT

These two programs were written to transfer data from a Nicolet 1090 digital oscilloscope through a Hewlett-Packard 9810 calculator that stores the data on a specially prepared tape cassette. They were written to replace a series of six programs described in AFFDL-TM-77-20 and thus simplify the oscilloscope recording process. Also included are operating instructions for these programs.

FOREWORD

This report contains the operating instructions and program for transferring data from the 1090 series digital oscilloscope to a 9810 Hewlett-Packard calculator tape cassette. The programs were written by David V. Breitenbecher. The work was performed as part of AFFDL in-house work unit number 24041304, "Development of Thermal and Flow Measurement Techniques," of task number 240413, "Aerodynamic Ground Test Technology" and covers work between August 1978 to November 1978.

The author wishes to acknowledge the invaluable assistance of Rita L. Kibler, who typed the drafts.

TABLE OF CONTENTS

SECTION I

INTRODUCTION

This report contains a brief description and instructions for operating two programs written to transfer data from Nicolet 1090 digital oscilloscope through a Hewlett-Packard 9810 calculator that stores the data on a specially prepared tape cassette. These two programs were written to replace a series of six programs described in AFFDL-TM-79-20-FXN and thus simplify the oscilloscope data recording process.

These programs are: Oscilloscope Recording Program - 1978, used to store data from the Nicolet 1090 digital oscilloscope on a tape cassette; and File Marking Program for Tamarak, used to make the storage cassette.

SECTION II

DIGITAL OSCILLOSCOPE CASSETTE RECORDING SYSTEM

There are two programs for controlling the flow of data between the Nicolet digital oscilloscope and the H-P tape cassette.

a. File Marking Program for Tamarak (FMPT).

b. Oscilloscope Recording Program - 1978 (ORP-78).

The first program is used to make a cassette on which the data from the digital oscilloscope may be stored. See "Instructions for Making Data Storage Cassette". The cassette tape contains the storage buffers for 4096 words from the oscilloscope memory plus storage area for other data as shown in Table 1.

The first program initialized the cassette tape, generates 65 files, each containing 64 registers, and writes the cassette number in the first register of the first file. The first file is also used to store the data shown in Table 1. The next 64 files, containing a total of 6094 words, are used to store oscilloscope memory data.

The second program has five uses for operations: one, List Scope Data, list the data in the first file; two, Change Run Number and Date; three, Record Scope Data, record data into the first file; four, Scope to Cassette, transfer data from the oscilloscope memory to the cassette; five, Cassette to Scope, transfer oscilloscope data from the cassette to the oscilloscope memory.

List Scope Data may be used any time the operator desires to know the contents of the first file. Change Run Number and Date may be used when the

TABLE I

STORAGE ALLOCATIONS IN THE FIRST FILE

LOC REG NO.	DATA
0	File Number/Cassette Number
1	Date
2	Number of Runs/Number of Divisions Used
3	Sweep Time Per Point Multiplier
4	Sweep Multiplier in Seconds
5	Number of Channels
6	Voltage Scale in Use
7	Voltage Scale in Use
8	Signal Offset in Volts
9	Signal Offset in Volts
10	Run Number of First Quarter
11	Run Number for Next Transfer
12	Number of Divisions on Oscilloscope
13-64	Not Used

operator wishes to reuse the cassette for new data and it is required to change the run number, date, and/or number of quarters to make the cassette correct. Record Scope Data is used to record scope data on a new cassette or when extensive changes must be made to preused cassette. Scope to Cassette is used to transfer memory data from the oscilloscope to the cassette. Cassette to Scope is used to transfer previously recorded data from a cassette back to the oscilloscope memory.

SECTION III

INSTRUCTIONS FOR MAKING DATA STORAGE CASSETTE

I. Software and Hardware Required:

    a. H-P 9810 calcuator with the following ROM's:

        1. Position 1 - Mathematics Block

        2. Position 2 - Peripheral Control

        3. Position 3 - Cassette Memory Plotter Printer Alpha

    b. H-P 9865 cassette memory

    c. Tape cassette

    d. Program - File Marking System for Tamarak

II. Operating the Program

    a. Turn on 9810

    b. Load program

        1. Press: END, CLR, RUN

        2. Place program card in calculator

        3. Press: LOAD

        4. Remove card

    c. Turn on cassette

        1. Place tape in cassette

        2. Rewind

d. Place files on tape

    1. Press: END, CLEAR, CTN

    2. Calculator will print and halt

> FILE MAKING
> PROGRAM FOR
> TAMARAK
> ****************

    3. Enter file number

    4. Press: CTN

    5. Calculator will print file number, then place remaining files on the tape.

    6. When these files have been placed on the tape the calculator will print:

> FILES   1.*
> THROUGH   65.
> HAVE   64.
> REGISTERS
> ****************
> END PROGRAM

e. See Appendix A for print out

SECTION IV

INSTRUCTIONS FOR OPERATING OSCILLOSCOPE RECORDING PROGRAM 1978

I. Software and Hardware Required:

a. H-P 9810 calculator with the following ROM's:

1. Position 1 - Mathematics

2. Position 2 - Peripheral control

3. Position 3 - Cassette Memory Plotter Printer Alpha

b. H-P 9865 cassette memory

c. Nic 1090 or 1090A digital oscilloscope

d. Nic 191 digital interface

e. Data storage cassette

f. Program: Oscilloscope Recording Program - 1978

II. Operating Instructions

a. Insert programmed data storage cassette into cassette memory.

b. Connect and turn on calculator, cassette memory, oscilloscope, and digital interface.

c. Set oscilloscope memory to ALL

d. Rewind cassette memory

e. Load program (Oscilloscope Recording Program - 1978)

1. Press: END, CLR, RUN

2. Place program card in calculator

3. Press: LOAD

4. Remove card

f. Run program

   1. Press: END, CLR, CTN

   2. Calculator will print and halt.

                    OSCILLOSCOPE
                    RECORDING
                    PROGRAM
                    ****

                    OPERATION CODES

                    ****

                    1..LIST SCOPE
                       DATA

                    2..CHANGE RUN
                       NUMBER AND
                       DATE

                    3..RECORD SCOPE
                       DATA

                    4..SCOPE TO
                       CASSETTE

                    5..CASSETTE TO
                       SCOPE
                    ****
                    ENTER OPERATION
                    CODE

   3. The operator then enters the operation code from above. See
Section 2 for explanations of the codes. Go to the instruction for the
operation code in Section V.

INSTRUCTIONS FOR OPERATION CODES

I. List Scope Data

    a.   Enter 1

    b.   Press CTN

    c.   Program will print the following and halt

```
****************

     OSCILLOSCOPE
       SETTINGS
       ******

    CASSETTE NO.
          24.000

     DATE
          780921.000

    RUN NO.
          48.000

    RUN NO.
          49.000

    RUN NO.
          50.000

    RUN NO.
          51.000

    MEMORY SIZE
          1024.000

    MEMORY DIVISIONS
          4.000

    SWEEP TIME SEC.
    MULTIPLIER
          0.500
```

```
                MAGNITUDE
                        -5.000

                NO. OF CHANNELS
                         2.000

                VOLTAGE SCALE
                        10.000

                VOLTS

                OFFSET

                         0.000

                VOLTS

                ***************

                ENTER OPERATION

                CODE
                         1.0*
                ***************
```

d. At this time the program is ready for another operation code.

e. See Appendix B for sample print out.

II. Change Run Number and Date

a. Enter 2

b. Press CTN

c. Program will print the following and halt

```
                ***************
                DATE  YYMMDD..→*
```

d. Enter date (year, year, month, month, day, day)

e. Press CTN

f. Program will print the following and halt

NO. OF RUNS

g. Enter number of runs

h. Press: CTN

i. Program will print the following and halt

RUN NO. OF
FIRST QUARTER →X

j. Enter run number of first quarter or first half

k. Press: CNT

l. Program will print the following and halt

****

ENTER OPERATION
CODE

****

m. At this point the program is ready for another operation code.

n. See Index C for sample print out

III. Record Scope Data

a. Enter 3

b. Press CTN

c. Program will print the following and halt

****

NO. OF DIVISIONS
ON SCOPE

d. Enter data, press CTN

e. Program will print the following and halt

****

NO. OF DIVISION
USED

f. Enter data, press CTN

g. Program will print the following and halt

****

SWEEP TIME PER
POINT
MULTIPLIER

h. Enter data, press CTN

i. Program will print the following and halt

ORDER OF
MAGNITUDE
IN SECONDS

j. Enter data, press CTN

k. Program will print the following and halt

****

VOLTAGE SCALE
IN USE

l. Enter data, press CTN

m. Program will print the following and halt.

****

SIGNAL OFFSET
IN VOLTS

n. Enter data, press CTN

o. Program will print the following and halt

```
***************

ENTER OPERATION

CODE
```

p. At this point the program is ready for another operation code

q. See Appendix D for sample print out

IV. Scope to Cassette Transfer

a. Enter 4

b. Press CTN

c. Program will transfer the data from the oscilloscope to the cassette.

d. Upon completion of the transfer the program will print the following and halt.

```
***************

SCOPE→CASSETTE

TRANSFER

CONCLUDED

***************

ENTER OPERATION

CODE
```

e. At this time the program is ready for another operation code.

f. See Appendix E for sample print out.

V. Cassette to Scope Transfer

a. Enter 5

b. Press CTN

c. Program will transfer data from the cassette to the oscilloscope.

d. Upon completion of the transfer the program will print the following and halt.

```
****************
CASSETTE→SCOPE
   TRANSFER
****************

ENTER OPERATION
CODE
```

e. At this time the program is ready for another operation code.

f. See Appendix F for sample print out.

APPENDIX A

```
****************

FILE MAKING
PROGRAM FOR
TAMARAK
****************

ENTER FILE NO.→X
            25.*

****************

FILES        1.*

THROUGH      65.

HAVE         64.

REGISTERS

****************

END PROGRAM

****************
```

APPENDIX B

ENTER OPERATION

CODE

1.0*

****

OSCILLOSCOPE
SETTINGS
******

CASSETTE NO.
25.000

DATE
780921.000

RUN NO.
48.000

RUN NO.
49.000

RUN NO.
50.000

RUN NO.
51.000

MEMORY SIZE
1024.000

MEMORY DIVISIONS
4.000

SWEEP TIME SEC.
MULTIPLIER
0.500

MAGNITUDE
-5.000

NO OF CHANNELS
2.000

17

VOLTAGE SCALE
        10.000
VOLTS

OFFSET
        0.000
VOLTS

APPENDIX C

ENTER OPERATION
CODE
                2.000*

****

DATE   YYMMDD..→*
           780921.0*

   NO. OF RUNS
                4.0*

     RUN NO. OF
   FIRST QUARTER →X
             48.0*

APPENDIX D

ENTER OPERATION
CODE
                3.000*

****

NO. OF DIVISION
ON SCOPE
                4.000*

****

SWEEP TIME PER
POINT
  MULTIPLIER
                0.500*

  ORDER OF
MAGNITUDE
  IN SECONDS
               -5.000*

****

VOLTAGE SCALE
IN USE
               10.000*

****

SIGNAL OFFSET

APPENDIX E

```
ENTER OPERATION
CODE
                4.*

****************

  SCOPE→CASSETTE
    TRANSFER
    CONCLUDED
```

APPENDIX F

```
ENTER OPERATION
CODE
                5.*

****************

CASSETTE→SCOPE
    TRANSFER
    CONCLUDED
```